

## External characters suggest that Long-tailed Manakin *Chiroxiphia linearis* is monotypic

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Received 21 February 2010; final revision accepted 10 March 2011

**SUMMARY.**—Long-tailed Manakin *Chiroxiphia linearis* has long been considered a polytypic species, with *C. l. linearis* in the north of the range (southern Mexico to Guatemala) and *C. l. fastuosa* in the south (from El Salvador to northern Costa Rica). Despite that no biogeographical barriers are known in the central region of the species' range and that monotypy has already been suggested, this treatment has persisted for almost 90 years. A morphological investigation (plumage and mensural data) reported here suggests that *C. linearis* is better treated as a monotypic species.

Long-tailed Manakin *Chiroxiphia linearis* (C. L. Bonaparte, 1838), which ranges from southern Mexico (in eastern Oaxaca and Chiapas) south almost exclusively over the Pacific slope to northern Costa Rica (AOU 1998), is generally considered to be polytypic, with two subspecies recognised by most recent works (Snow 1979, Dickinson 2003, Snow 2004). Despite that Lesson (1842: 174) had already recognised southern populations separately, under the name *Pipra fastuosa* (type locality Nicaragua), the keynote reviews of American birds in the first third of the 20th century, Ridgway (1907) and Hellmayr (1929), both treated *C. linearis* as monotypic. Lesson's diagnosis alone, in fact, contains nothing on which to base recognising more than one taxon within *C. linearis*. However, Bangs & Peters (1928: 397) promulgated that two subspecies should be recognised, based on the length of the central rectrices (shorter in northern populations) and the larger (presumably longer) and relatively broader bill of northern birds, which differences Ridgway (1907) had already noted but had chosen not to recognise nomenclaturally. Subsequently, most authors have been content to subdivide the species into *C. l. linearis* in the north of the range, from southern Mexico to Guatemala, with *C. l. fastuosa* (Lesson, 1842) from El Salvador south to Costa Rica, despite the lack of any obvious geographical 'divide' between the two populations.

Monroe (1968), however, refuted the notion that bill length or width should be considered a valid subspecific character in *C. linearis*, and pointed to extensive overlap in measurements between birds from Oaxaca (Mexico) and Costa Rica in bill sizes. Monroe (1968) also questioned whether the purported difference in tail-feather length was real, noting 'considerable overlap in measurements between Oaxacan and Costa Rican populations'. During work on Pipridae for a forthcoming monograph (Kirwan & Green in press), I re-evaluated Monroe's (1968) recommendation to return the species to monotypy based on material held at The Natural History Museum (NHM), Tring, UK, the Cambridge University Museum of Zoology (CUMZ), Cambridge, UK, the Field Museum of Natural History (FMNH), Chicago, USA, and the Museo Nacional (MNCR), San José, Costa Rica, from across the species' entire range.

For fully adult males held in the four institutions visited, I can find no obvious difference in bill length (or in any other mensural character sampled; see Appendix), whilst in respect of the length of the central rectrices in *C. l. linearis* (124–165 mm, mean = 148.22 mm;  $n = 19$ ) vs. *C. l. fastuosa* (112–172 mm, mean = 149.33 mm;  $n = 34$ ), the purported difference also appears insignificant (see Table 1, Fig. 1). Bill width was not sampled as it

TABLE 1

Morphometrics (in mm) of male Long-tailed Manakins *Chiroxiphia l. linearis* and *C. l. fastuosa*. Mean is given, followed by standard deviation and complete range, and comparison t-tests. For measuring protocols see the Appendix.

	N	Wing length	Tail length	Bill length
<i>C. l. fastuosa</i>	25	70.08 ± 1.41 (68.0–72.5)	150.6 ± 16.9 (112.0–182.0)	11.023 ± 0.542 (10.32–12.01)
<i>C. l. linearis</i>	10	68.55 ± 1.14 (67.0–70.0)	146.8 ± 14.3 (124.0–165.0)	11.415 ± 0.635 (10.61–12.43)
Comparison t-test		P=0.005	NS	NS

NS = not significant, the null hypothesis of equal means could not be rejected.

Variable	PCA loadings		
	PC 1	PC 2	PC 3
Wing	-0.7089	0.6767	-0.1989
Tail	-0.7051	0.6877	0.173
Bill	0.01966	-0.2629	-0.9646
Variance explained	1.30705	0.714897	0.399954
% of variance	53.968	29.518	16.514

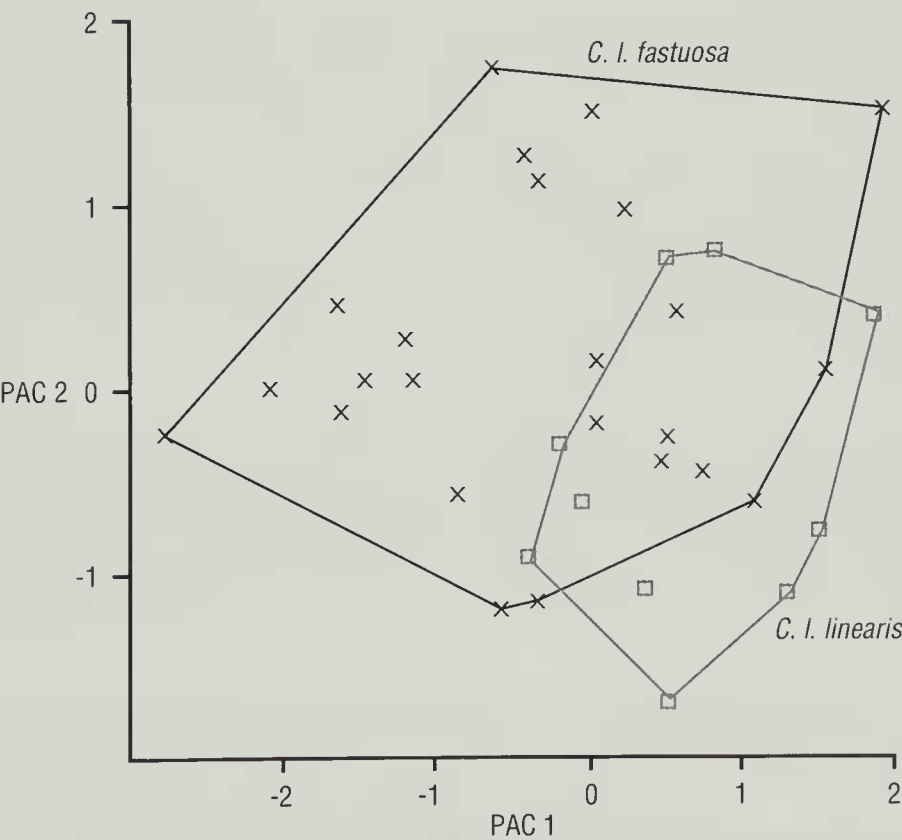


Figure 1. Scatter plot diagram of first (PC1) and second (PC2) principal components for a Principal Components Analysis of three morphometric measurements from both described taxa of Long-tailed Manakin *Chiroxiphia linearis*.

is a relatively difficult character to sample consistently and accurately; furthermore, even using a distinctly less rigorous application of the Biological Species Concept than favoured by this author, it would be somewhat marginal to uphold a taxonomic unit on the basis

TABLE 2

Morphometrics (in mm) of male Long-tailed Manakins *Chiroxiphia l. linearis* and *C. l. fastuosa*, with specimens from El Salvador excluded (see text). Mean is given, followed by standard deviation and complete range, and comparison t-tests. For measuring protocols see the Appendix.

	N	Wing length	Tail length	Bill length
<i>C. l. fastuosa</i>	19	70.34 ± 1.44 (68.0–72.5)	151.1 ± 17.9 (112.0–182.0)	10.963 ± 0.533 (10.32–11.70)
<i>C. l. linearis</i>	10	68.55 ± 1.14 (67.0–70.0)	146.8 ± 14.3 (124.0–165.0)	11.415 ± 0.635 (10.61–12.43)
Comparison t-test		P=0.002	NS	NS

NS = not significant, the null hypothesis of equal means could not be rejected.

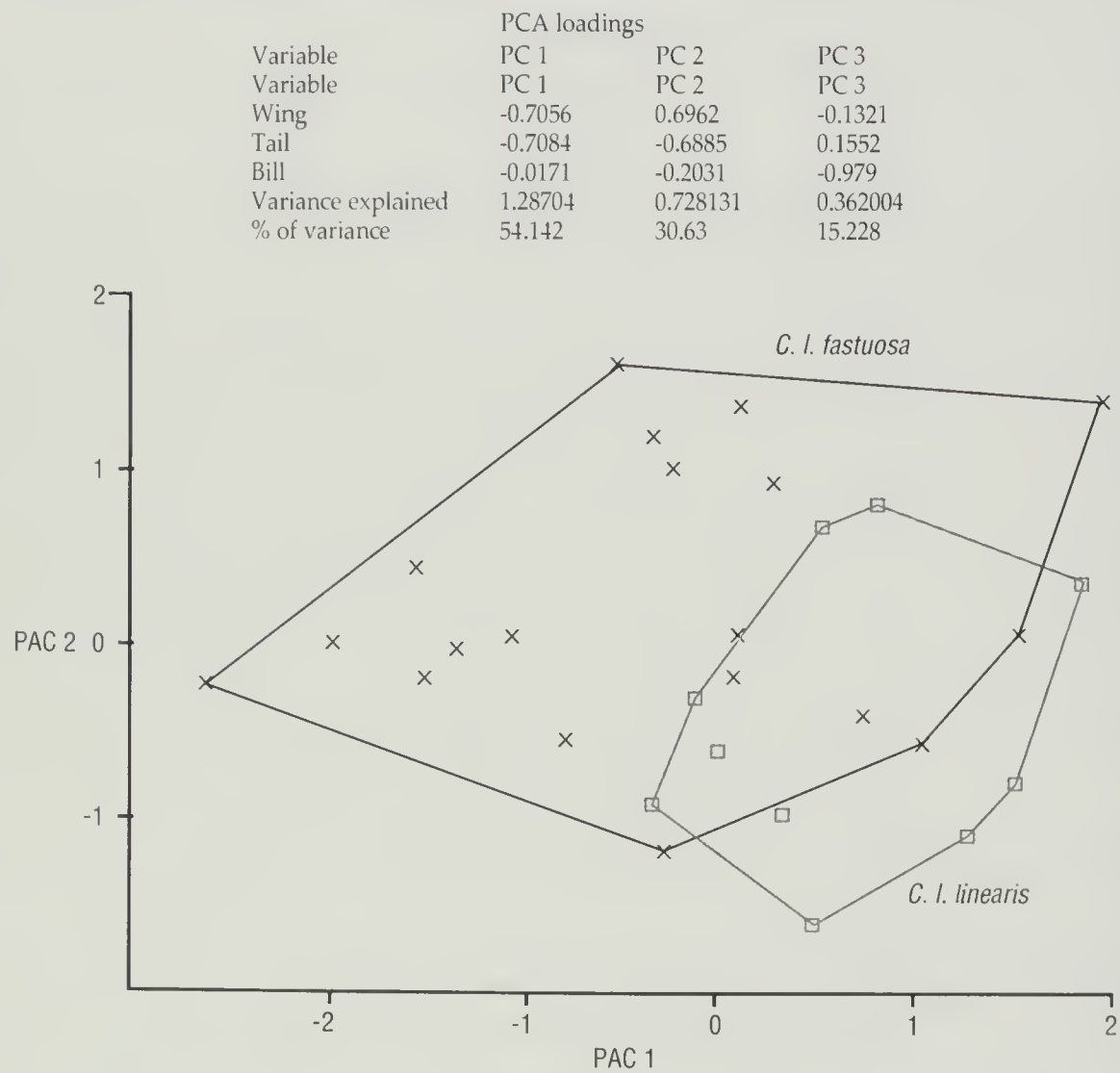


Figure 2. Scatter plot diagram of first (PC1) and second (PC2) principal components for a Principal Components Analysis of three morphometric measurements from both described taxa of Long-tailed Manakin *Chiroxiphia linearis*; specimens from El Salvador are excluded from this analysis.

of so minor a character. (Specimens of *C. l. linearis* are from Mexico and Guatemala, and specimens of *C. l. fastuosa* are from El Salvador, Nicaragua and Costa Rica; measuring protocols are described in the Appendix.) A random subset of 35 males held at FMNH was subjected to a morphometric analysis and Principal Components Analysis, which revealed no significant variation between males of the two subspecies in tail (central rectrices) or bill

lengths (Table 1, Fig. 1). Because the El Salvador specimens (six included within the FMNH subset) might be construed to represent a transition zone between the two 'populations', their localities were investigated. The six males pertain to the following localities: Parque Nacional El Imposible, Ahuachapán ( $n = 1$ ), Laguna Olomega, San Miguel ( $n = 2$ ), Puerto del Triunfo, Usulután ( $n = 1$ ) and Los Blancos, north-east of San Miguel ( $n = 2$ ). The first-named locality is in western El Salvador, whereas the other three are all in the eastern third of the country, which might be considered less likely to be sited within a transition zone between the two subspecies. Again, no significant variation between males of the two subspecies was found in tail (central rectrices) or bill lengths (Table 2, Fig. 2). In both cases, variation in wing length was uncovered, but was not highly significant.

It is worth remarking that an additional factor that needs to be considered in attempting to divine geographic variation in tail length is that this character apparently decreases with age once males have achieved fully adult plumage (Arévalo & Heeb 2005), which could easily 'cloud' efforts to distinguish inter-population differences.

*C. l. fastuosa* has, more recently, also been stated to differ from *C. l. linearis* in being overall brighter, with the red hindcrown feathers forming a short crest (Snow 2004), which my examination of the material at the four museums visited again suggests is impossible to validate. I can recognise no evidence of overall (consistent) differences in coloration between northern and southern populations, or that males in the south of the species' range possess a greater tendency to show a crest-like effect on the hindcrown. And, no other author (of which four, Ridgway, Hellmayr, Bangs & Peters, and Monroe, might have been expected to notice them) has suggested that such characters may be used to delimit two races in *C. linearis*.

Whether molecular data might yet shed fresh light on this manakin's taxonomy must remain an open question for now, but McDonald (2003) already uncovered evidence for asymmetric gene flow between two nominally disjunct populations of Long-tailed Manakins in north-west Costa Rica. For now, I postulate that the available (morphological) evidence favours returning *C. linearis* to monotypy just as Burt Monroe recommended over 40 years ago.

#### Acknowledgements

I thank Mark Adams and Robert Prŷs-Jones for their tireless assistance at The Natural History Museum, Tring. For similar courtesies I am grateful to Ghisselle Alvarado and Silvia Elena Bolaños at the Museo Nacional de Costa Rica, San José, Costa Rica, Michael Brooke at the Cambridge University Museum of Zoology, and David Willard, Mary Hennen and John Bates at the Field Museum of Natural History. Finally, but certainly not least, I thank my referees, David Anderson and Oliver Komar, for their valuable contributions to the manuscript.

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#### Appendix: mensural data for *Chiroxiphia linearis*.

Measurements were taken using a metal wing rule and digital callipers, and for males were based on fully adult-plumaged birds with apparently full central rectrices (for which see the text); here, tail refers to the length of the main tail, not the central rectrices. Value ranges are complete. A random subset of 35 males held at the Field Museum of Natural History (FMNH) was subjected to a morphometric analysis using three characters (see Table 1, Fig. 1). Mean values are rounded up or down to the nearest 0.1 mm or 0.01 mm. For other museum acronyms see main text.

*Chiroxiphia l. linearis* (BMNH; CUMZ; FMNH: Mexico and Guatemala): wing of male ( $n = 20$ ) 67–74 mm (mean = 68.6 mm), wing of female ( $n = 6$ ) 68–72 mm (mean = 69.5 mm); tail of male ( $n = 12$ ) 27–35 mm (mean = 32.7 mm), tail of female ( $n = 6$ ) 30.5–36.0 mm (mean = 33.6 mm); bill of male ( $n = 20$ ) 10.56–12.43 mm (mean = 11.41 mm), bill of female ( $n = 5$ ) 11.47–12.44 mm (mean = 11.82 mm); tarsus of male ( $n = 12$ ) 17.78–19.67 mm (mean = 18.67 mm), tarsus of female ( $n = 6$ ) 15.91–18.36 mm (mean = 17.34 mm).

*Chiroxiphia l. fastuosa* (BMNH; CUMZ; FMNH; MNCR: Costa Rica, El Salvador and Nicaragua): wing of male ( $n = 37$ ) 68–74 mm (mean = 70.1 mm), wing of female ( $n = 6$ ) 62.5–72.0 mm (mean = 67.4 mm); tail of male ( $n = 13$ ) 29–34 mm (mean = 32.1 mm), tail of female ( $n = 6$ ) 30.5–37.0 mm (mean = 34.0 mm); bill of male ( $n = 37$ ) 10.04–12.01 mm (mean = 10.94 mm), bill of female ( $n = 8$ ) 10.75–11.80 mm (mean = 11.39 mm); tarsus of male ( $n = 12$ ) 16.48–19.14 mm (mean = 18.04 mm), tarsus of female ( $n = 6$ ) 16.84–18.18 mm (mean = 17.35 mm).